Air & Space

National Air & Space Museum
Smithsonian Institution
Vol. 6, No. 2 Winter 1982

Commercial Aviation

National Air and Space Museum
Walter J. Boyne, *Acting Director*

Education Services Division
Janet K. Wolfe, *Chief*

Air & Space
Linda S. DuBro, *Managing Editor*
Holly Haynes, *Design and layout*

Air & Space, a mini-magazine for educators, is published four times during the school year as an outreach of the National Air and Space Museum, Smithsonian Institution, Washington, D.C.

Air & Space combines information from many sources for a condensed overview of the history, science, technology, and social impact of selected aviation and space subjects.

Air & Space
Address all communications to: *Air & Space*, Room P-700, Education Services Division, National Air and Space Museum, Smithsonian Institution, Washington, D.C. 20560. For changes or corrections of address, write to *Air & Space* at the above address, and include the 6-digit subscription number on your mailing label.

There is no charge for *Air & Space*. The magazine is not available by paid subscription.

Commercial interests and other publications wishing to reprint material should mail requests to the above address.

Back issues of *Air & Space* are available on microfiche or photocopy through University Microfilms International, Inc., 300 N. Zeeb Road, Ann Arbor, Michigan 48106.

MUSEUM HOURS
Through Labor Day (September 7), the Museum will be open 10 a.m. to 9 p.m. From September 8 to March 31, hours are 10 a.m. to 5:30 p.m. The Museum is open to the public every day of the year except Christmas. Admission is free.

For brevity, the National Air and Space Museum is often referred to in these pages as NASM. The National Aeronautics and Space Administration is NASA.

Photo Credits:
Front and Back Cover, pp. 5, 7—*Courtesy Lufthansa*; top photo p. 8, p. 9—*Courtesy K.L.M.*; bottom photo p. 9—*Courtesy Pan American Airlines*; p. 15—*Courtesy Northrop Corporation*; p. 16—*Courtesy James O. Plinton, Jr.*; p. 17—*Courtesy Perry H. Young, Jr.*; pp. 3, 4, 6, 10, 11, 12, 13, 14, 18—*Courtesy NASM*

Cover Photo:
Assistance from ground personnel was available even at the dawn of commercial aviation. Here a Lufthansa passenger is lent a helping hand.

Briefing

Commercial Aviation

Walter J. Boyne,
Acting Director, NASM

Commercial air transportation in the U.S. has always, since its inception with the St. Petersburg-Tampa Airboat Line in 1914, been preoccupied with the concept of risk. Flying was always represented as a safe, pleasurable experience, even in those days when it was neither safe nor pleasurable. In recent years, risk to the passenger has almost been eliminated. Many statistics prove that commercial air transportation is safer by far than travel by road.

Yet the risk in using commercial air transportation was always greater for the companies involved than for the customers, and these sorts of risks are with us to a larger degree than ever before. From the very beginning, aircraft manufacturers extended themselves to the limits (and usually beyond) of their financial capability to create aircraft that would be attractive to airlines. Similarly, the airline companies continued to take risks by acquiring such equipment, taking new routes, and providing new services.

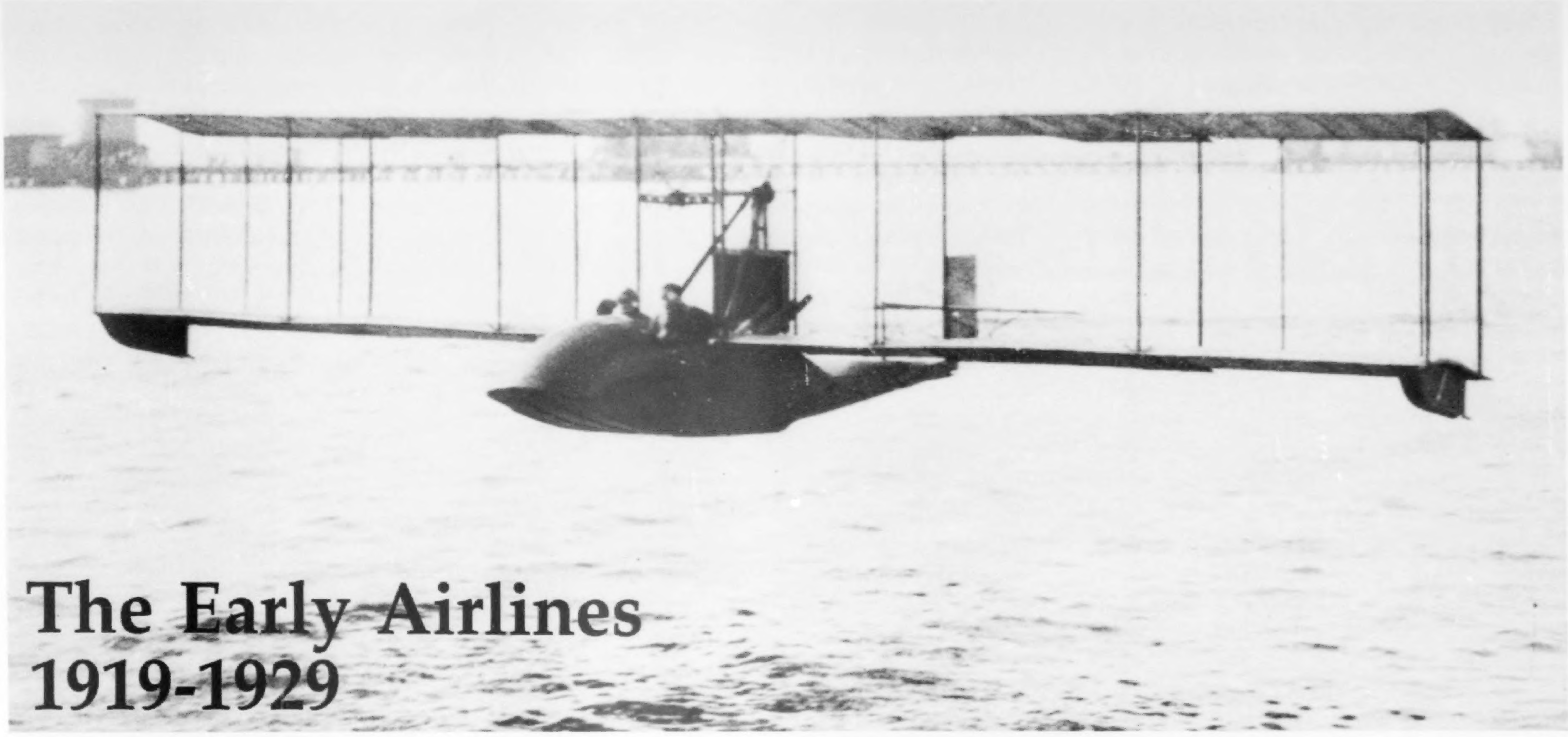
There was no correlation to the average industrial world of "return on fixed investment," or the concepts of building a solid base of factories, offices, sales force, and so on that would have a permanence like General Motors or U.S. Steel. Instead, each cycle of new equipment and new opportunities would result in tremendous, often lethal, competition that would cause first one firm and then another to gain ascendancy and then fall back.

During the years of Civil Aeronautics Board regulation, competition was dampened, much to the distress of those in the industry who felt that they could best survive by being able to compete freely. Even during this sheltered time, however, corporations such as Lockheed, Boeing, and Douglas would have teetered near the brink of bankruptcy if sufficient sales of their then current product had not been made.

In recent years, two events have occurred, raising the stakes even higher. The first is one that affects all of us, the increase in oil prices. The second is "deregulation," the opening of the airline industry to free competitive influences. With these events have occurred trauma beyond any previous conception. Institutions that operated profitably for years have suddenly become paralyzed with staggering, probably incapacitating, losses. Braniff, long noted for the prudence and stability of its operation, if not for perfect service when freed of the restraint of competition, suddenly expanded—only to fall into bankruptcy.

Despite all this, the emphasis on passenger safety has never been greater. It is a curious anomaly that in a business where "risk" was once a forbidden word and accidents unmentionable, there now looms concern for financial survival. Perhaps it is time to have the same concern for the firms' financial safety that the firms have for the passengers' safety and to provide legislation that will reintroduce regulation. Competition that leads to chaos is obviously not an enduring solution.

The Early Airlines 1919-1929



The Benoist flying boat was photographed while operating a regular service between St. Petersburg and Tampa, Florida, in 1914. This was the world's first scheduled air service. The 27-km (17-mi.) Florida route lasted only three months.

R.E.G. Davies
Lindbergh Professor of Aerospace History
Department of Aeronautics, NASM

The U.S. launched the world's first scheduled airline, the St. Petersburg-Tampa Airboat line in 1914, barely a decade after the Wright brothers' first epoch-making heavier-than-air controlled flight. But that 27-km (17-mi.) Florida route lasted only three months, and the next regularly scheduled airlines were not established until 1919. Most of these too were short-lived, although the achievements of Aeromarine in the U.S. were considerable and have not been fully recognized by many airline historians.

Indeed Aeromarine, founded by the visionary Inglis Uppercu, was laying the foundation for a practical airline system in the U.S. Aeromarine employed Curtiss F–5L flying boats, which were quite large for their time, and almost a decade passed before aircraft with greater capacity, Ford Tri-Motors, were used. Uppercu opened an international passenger service from Key West to Havana, which was also the first U.S. foreign airmail route. He also offered flights in the northeast and the Great Lakes area, switching the fleet on a seasonal basis, operating in the north in the summer and in Florida in the winter. Several southbound Aeromarine flights were appropriately dubbed *The Highball Express*, as thirsty New Yorkers sought relief from Prohibition in Cuba or the Bahamas.

Aeromarine operated the only sustained passenger service during this period. There were other tentative efforts, notably by Syd Chaplin (Charlie's brother) who for a year starting in 1919 operated an airline that flew from Wilmington to Catalina Island. But the U.S.' main contribution to the development of air transport during the early 1920s was in carrying airmail, simultaneously gaining experience in setting up the necessary infrastructure to sustain the operation. But while the U.S. Post Office Air Mail Service was laying the foundation for an extensive U.S. airline system, the pace was being set in Europe and elsewhere.

In Germany before World War I, dirigible airships had carried no less than 34,000 passengers on intercity sight-seeing flights. No doubt the Germans intended to develop regular service, but the war intervened. Oddly enough this was a fortuitous blessing. Airships could not have coped with the growing European traffic volume, and the only possible future for lighter-than-air craft was perceived to be over long distances. Before World War II, no one could visualize the enormous growth of transoceanic travel that was to occur after the war.

After the 1914-18 conflict, Europe turned quickly to air transport while the U.S. lagged behind. The main belligerent countries had built heavy bombers during the latter stages of the war, and these were easily converted for passenger carrying. There had been much disruption of surface communications, so to take to the air was a logical step. Also, the most important European countries at the time, the U.K. and France, were separated by a stretch of sea. Even a ponderous bomber could cover the London-Paris journey in three hours, compared to the eight hours demanded by rail and train ferry. Also, many governments viewed the creation of an airline as a contribution to national prestige.

Remarkably, the harsh terms of the Treaty of Versailles had the opposite effect than was intended on German aviation development. First, the restrictions on aircraft size and engine power forced designers and engineers to use great ingenuity to produce a superb product, the Junkers F 13. This, the world's first all-metal airliner, carried five people in surprising comfort and was still in service in Brazil in 1947. Second, for many years the Germans were not allowed to fly aircraft into foreign territory, yet (was it a careless oversight?) there were no restrictions on flying within Germany. Thus, by the end of 1920, Germany already had a respectable domestic air network. The foreign problem was overcome by setting up subsidiaries or associates in other countries, which provided a ready market for German aircraft exports.

Other European countries did not lag behind. Backed by a generous government subsidy, French airlines flourished not only in France and neighboring countries but also flew to North Africa and, in direct competition with the famous Orient Express, to Istanbul. The British contented themselves with a few cross-Channel routes but also laid the foundation of their future empire air route network by starting the Desert Air Mail in 1921, from Cairo to Baghdad. The Dutch K.L.M., with the talented Anthony Fokker now supplying civil aircraft, quickly expanded under the direction of Dr. Albert Plesman. The Belgians started the first airline in Africa, in what was then the Belgian Congo, in 1920.

For the record, in 1917 Austria began the world's first regular public airmail service when it linked Vienna with Kiev in suport of wartime arrangements to organize food suplies for the beleaguered capital. Germany began the first domestic air passenger, mail, and freight service in February 1919, from Berlin to the new capital Weimar. France began the first international air route, from Paris to Brussels, the following month. By the summer, no less than five airlines were operating several daily flights between London and Paris.

By 1927 (when the U.S. had only a few airmail routes) almost every country in Europe had its own flourishing airline. Germany dominated the air networks. Deutsche Luft Hansa, founded in 1926 to amalgamate the Junkers and Lloyd groups, reached almost every European capital, the Black Sea, the Caucasus, and Persia. Deruluft, the German-Russian joint enterprise, maintained the air service from Berlin to Moscow. The French had reached West Africa as the first step towards South America, and the British were laying the foundations of their empire air network, drawing on the experience of the 1921 Desert Air Mail and the development of multi-engined flying boats to cross the Mediterranean Sea.

Outside Europe and North America, a dearth of long-distance surface communications stimulated airline progress. In Australia, the first transcontinental railroad was not opened until 1917; the African "Cape-to-Cairo" railway was never completed; only India and Japan in Asia and only Argentina in Latin America could boast good railways. In these continents the seed of air transport quickly germinated.

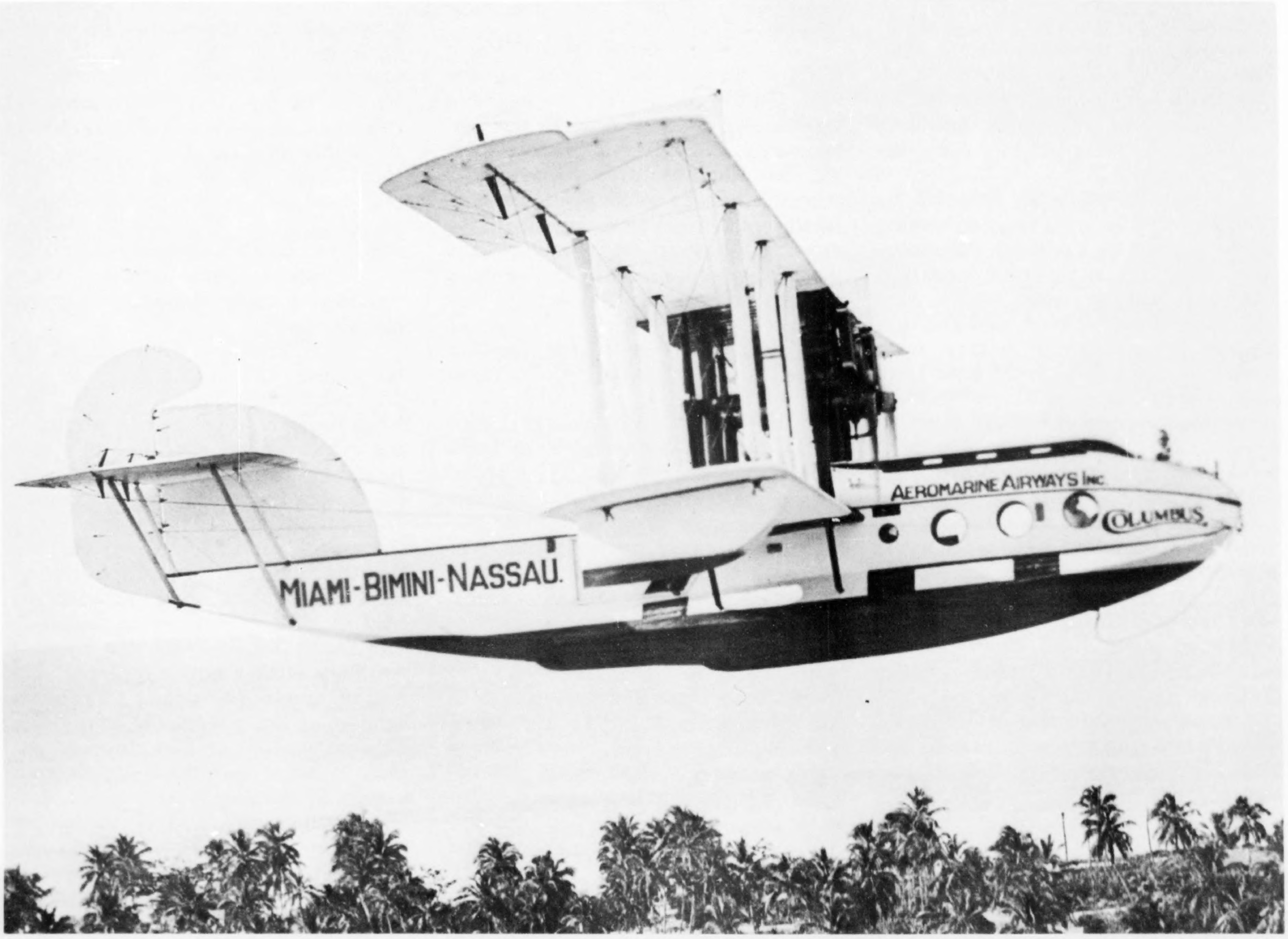
In Latin America the first scheduled airline was a little company, TAG, which began regular services in 1920 in French Guiana. This lasted only two years, but the most remarkable achievement was in Colombia, where the first sustained operation—with Junkers F 13 floatplanes—was established by SCADTA, the basic organization of which survives today in the shape of AVIANCA, Colombia's national airline.

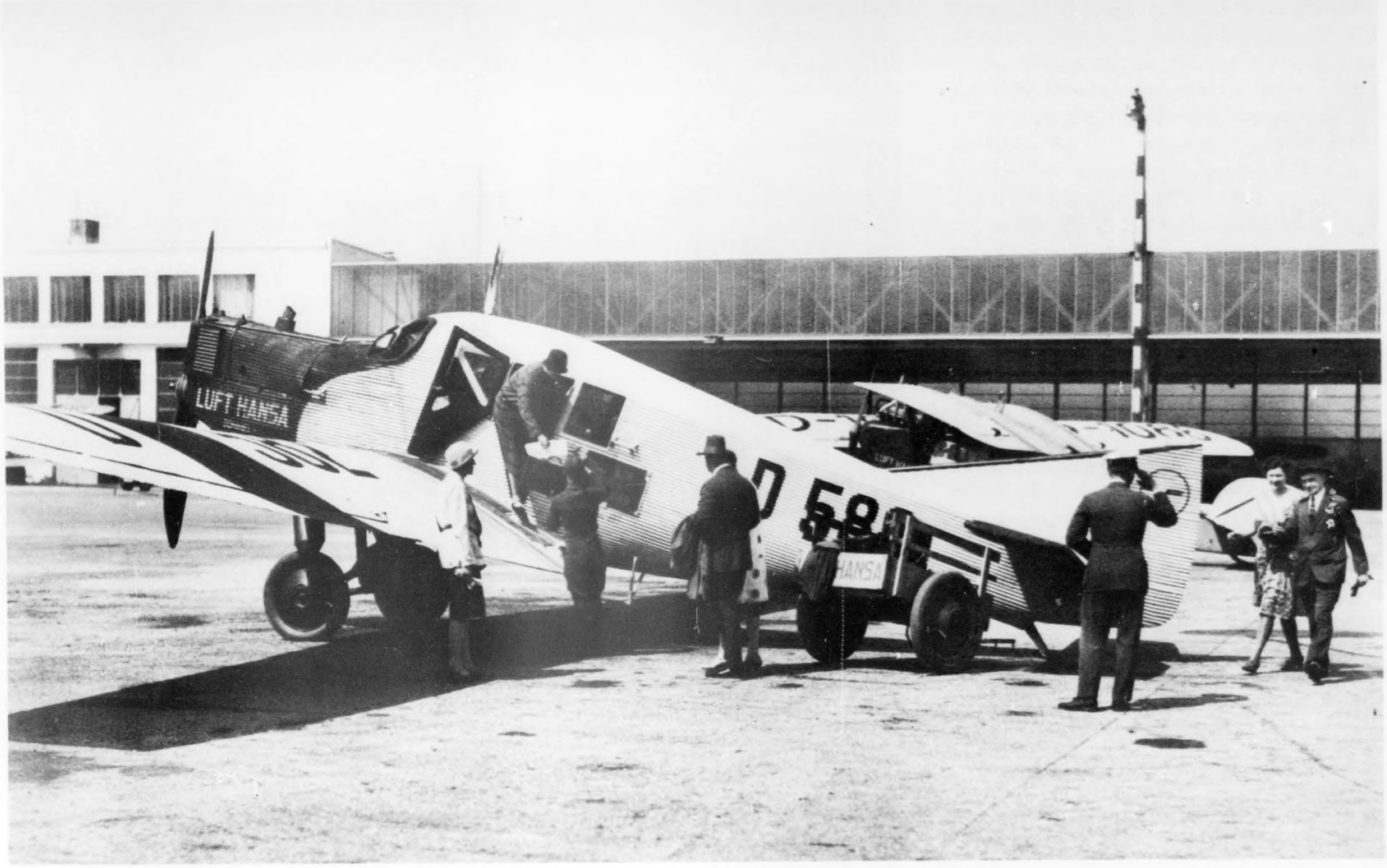
There were also early, but unsustained, airlines in Mexico, Cuba, and Argentina. Mexico's C.M.A. (now known as Mexicana), founded in 1924, can actually trace its corporate history back to an ancestor that served the Tampico oil fields in 1921. Credit should also go to isolated Bolivia, where Lloyd Aéreo Boliviano (still operating under that name) was founded by German settlers in 1925 using Junkers F 13s. Brazilian airlines were a vital factor in the economic development of the nation during the late 1920s. Larger than the continental U.S., Brazil's vast interior, remote, unknown, and unsurveyed, welcomed the transport airplane. One tiny Brazilian airline, VARIG, was to become one of the greatest and most respected in the world.

In Australia, another country where the large cities were separated by long distances, airlines quickly developed from the experience of bush pilots. West Australian Airways and QANTAS, from Queensland, were operating regularly and reliably as early as 1921, laying the foundation for Australia's justifiable claim that in terms of air travel, it was the most air-minded country in the world.

In what was then still romantically called The Dark Continent, the Belgians opened a regular air service along the Congo River. And in Thailand in 1922 air routes extended mail service beyond the rail termini. In Japan too, experi-

This Curtiss type 75 flying boat was able to carry up to 14 passengers on short flights as early as 1920. The Columbus, *which flew regularly between Miami and Nassau, covering the distance of 300 km (187 mi.) in two-and-one-half hours, is shown passing over the island of Bimini. Aeromarine pioneered the first international air services from Florida to the Bahamas and to Cuba. It also received from the U.S. Post Office the first foreign air mail contract, Key West to Havana.*





The world's first strut-free all-metal low-wing monoplane with a closed cabin, the Junkers F 13, was one of the great commercial aircraft in aviation history. It was designed and built in six months and entered service in Germany in July 1919. Carrying four or five passengers in a comfortable heated cabin, it was widely used for two decades. They operated as landplanes when equipped with wheels or skis, or floatplanes when fitted with pontoons. The last one in service was retired in Brazil in 1947.

mental air services had begun, although an ambitious program by the British in northern China was thwarted by internal political rivalries.

Observing this global activity was a group of concerned citizens in the U.S. In 1926 under the Coolidge administration, the Air Commerce Act was passed, following an epoch-making report to Secretary of Commerce Herbert Hoover. This act established the essential legislative framework within which an air transport industry could be built. It followed hard on the heels of the Kelly Air Mail Act, which authorized the transfer of the airmail carriage from the U.S. Post Office to private contractors, called carriers, a term that has been used to describe the airlines ever since.

Through the airmail payments, the U.S. Post Office retained a tight grip over the new airlines. Unfortunately, the system did not encourage interest in passengers, who had to surrender priority to the mail, carried by about two dozen newly formed airlines. A rare exception was Boeing Air Transport, which actually offered passenger seats on board and was able to outbid its competitors for mail contracts on the strength of the additional passenger revenue.

Following Lindbergh's epic New York-Paris solo flight in May 1927, the American public suddenly decided to take to the air, and American investors quickly decided that there was a future in air transport. Many companies gave attention to carrying passengers, notably Transcontinental Air Transport (TAT), which with substantial support from the Pennsylvania Railroad, planned a remarkable coast-to-coast route.

Henry Ford had produced the first practical U.S.-built airliner, the famous Ford Tri-Motor, affectionately known as the "Tin Goose." But it was slow, cruising at about 145 km/hr (90 mph). Also, in spite of admirable progress with the Lighted Airway, a nationwide system of aerial lighthouses that guided the pilots at night, navigation across both the Alleghenies and the Rockies was still hazardous. TAT enrolled a formidable combination, Lindbergh as Technical Adviser and pilot extraordinary and the Ford Tri-Motor. And for about a year beginning in July 1929, a coast-to-coast air-rail service was operated (air by day, rail, across the mountains, at night).

Despite the human and material assets, TAT lost money heavily because it had no mail contract. Postmaster General W.F. Brown, however, had been contemplating the fundamental problems and sponsored the McNary-Watres bill, an amendment to the Air Mail Act, which dramatically transformed the entire basis of airmail subsidy. Henceforth, contractors would be rewarded according to the amount of space offered rather than the volume of mail carried. This encouraged airlines to purchase larger aircraft, to add more services, and, under considerable pressure from the Postmaster General, to merge into airlines of substance.

In spite of the severe economic depression that characterized the times, the U.S. airline industry discovered its true role in transportation and flexed its muscles. Many smaller airlines merged to become the nuclei of the "Big Four": American, United, Eastern, and TWA. Under the provisions of the Foreign Air Mail (F.A.M.) contractual system, Pan American became the favored "chosen instrument" of the Post Office, quickly dominating the entire airways of Latin America.

With such a springboard for expansion at home: generous air subsidy supporting established airlines; an incentive to compete technically and operationally; and with a vigorous, subsidized airline abroad, the U.S. suddenly emerged from its air transport lethargy. In 1929 it ovetook Germany to becme the world's leading airline nation, a position that it has comfortably retained ever since. ■

The Great Days of the Airmail

Marcel Bouilloux-Lafont (1871-1944)

R.E.G. Davies
Lindbergh Professor of Aerospace History
Department of Aeronautics, NASM

In today's airline world, it would be unthinkable to base a decision affecting route or aircraft selection solely on the requirements for carrying mail. Typically, passengers account for 83 percent of the traffic, and most of the balance is air freight. Decisions affecting routes are based on complex studies of these markets; revenues from airmail are insignificant.

But it was not always so. There was a time when airline success or failure could depend entirely upon the patronage of the government department that controlled mail contracts. In Europe, particularly, international competition for airmail was often keen as the countries sought to enhance their national prestige by developing efficient mail service.

In the early days of airline development, mail provided the only guaranteed source of sustained non-seasonal revenue. The mail moreover never complained over discomfort or minor delays. Passengers on the other hand were fickle and demanding. Most important, in the formative years of the 1930s, when the airlines were moving from infancy into confident adolescence, the slow, small transport aircraft could not pay for themselves unless exorbitant fares were charged.

The U.S. Air Mail Act of 1925—the Kelly Act—had provided the first nourishment for the fledgling airlines. They had been kept alive, barely, by amendments in 1927 and 1928, which mildly stimulated Americans to send more letters by air. But the infant industry was given muscle by the third amendment, the so-called McNary-Watres Act of 1930, which for the first time encouraged the airlines to provide space for people as well as for mail sacks.

Until about 1930 there was little incentive for a passenger to take a plane. There was no passenger service south of Washington. The transcontinental fare was the equivalent of about $4000 at today's prices. The very establishment of an air industry in the U.S. was the result of first, Congress's shrewd airmail enabling acts, and second, the subsequent construction of a system of airmail routes under the supervision of Postmaster General Walter F. Brown.

The development of the airline industry in the United States owes its foundation to indirect subsidies through mail payments. From 1931 to 1933, an estimated $56 million was paid out, equivalent to $400 million today. When these indirect subsidies were subjected to meticulous accounting following the airmail scandal in 1934, the airlines were estimated to have made $34 million profit, all from mail payments.

After taking office, the real architect of this legislation, Postmaster General Brown, spent many months studying the effects of the Kelly Act and shrewdly analyzed its deficiencies. The old system of payment according to weight carried was replaced by a system of payment for space offered. The effect was revolutionary, as airlines vied with each other to add passenger service.

Unfortunately, Brown often attained his objectives by dubious means. He applied the strict letter of the law, but not the spirit of it, making some decisions that seemed not only to defy logic but also offended the American public's sense of fair play. After the Democrats swept into office in November 1932, his worst excesses were exposed by a Senate investigation, and President Roosevelt cancelled all airmail contracts in February 1934.

Then followed one of the most bizarre episodes in the history of air transportation. The Army Air Corps was asked to carry the mail and tried to comply despite the handicaps of inexperienced pilots, unsuitable aircraft, and the worst weather ever recorded in the Rocky Mountains. The result was a tragic fiasco, though not as blameworthy as many commentators have alleged. In fact, the Army was operating very efficiently before it had finished its assignment, but public opinion had been inflamed by the press and the airline lobby, and Roosevelt quickly reversed his decision.

A new era in U.S. commercial aviation began with the Black-McKellar Air Mail Act of 1934. The airlines once again bid for a pattern of air routes that bore a remarkable resemblance to the well-balanced transcontinental and domestic trunk network that Brown had designed. But the legal loopholes were plugged. More important, the airlines were now superbly equipped, an indirect effect of the Postmaster General's formula of airmail payments based on available space, thus encouraging construction of larger aircraft. Equally, his determination to stimulate competition between well-capitalized airlines on the all-important coast-to-coast routes gave birth to the modern airliner, epitomized by the DC-3.

Without airmail, airline development in the U.S. might have been indefinitely postponed, and Europe's lead in the 1920s might never have been challenged. By creating an airmail service, the U.S. Post Office kept alive the art and science of airplane operation; the early contract mail carriers then fashioned a precarious but recognizable framework; and master architect Brown gave it shape, form, and permanency. The great U.S. airlines and airliner builders then proceeded to build on unassailable foundations.

Meanwhile, the airlines in the Old World had made impressive progress, extending their route tentacles beyond the continent. European aircraft manufacturers had continued to produce aircraft for passengers, but carrying mail was still accepted as the commercial airliner's main purpose.

The problems, hazards, and ultimate achievements in carrying airmail were spectacularly demonstrated by the rivalry between the French and the Germans on the South Atlantic route to South America. The Treaty of Versailles of 1919 had deprived Germany of her overseas territories and much of her political influence. She sought, therefore, to build up trade in those areas of the world where the victorious Allies did not dominate. Latin America was a logical choice, and to a lesser extent doors were opened inthe Soviet Union and in China.

After its formation in 1926, Deutsche Luft Hansa had prepared the way for a South Atlantic mail route. In Brazil, the key nation (because its coastline extended about 4828 km (3000 mi.) along the Atlantic) Syndicato Condor was founded as an associated airline to provide a secure foothold in South America. Condor's aircraft were German, and most of the employees were German or of German descent.

Watching this with considerable apprehension was a patriotic Frenchman, Marcel Bouilloux-Lafont, a wealthy industrialist and banker with varied interests in Latin America. In 1927 he bought the Compagnie Générale d'Enterprises Aéronautiques (C.G.E.A.) from Pierre Latécoère, a French plane-builder. Latécoère had magnificently pioneered the French airmail route to West Africa, but he was frustrated in his ambition to reach Brazil.

When Bouilloux-Lafont took over, he changed the name of the airline to Aéropostale and in less than four years fashioned the largest airmail network in the world. He commissioned a fleet of fast naval ships to convey the mail from Dakar to Natal, Africa, until aircraft with sufficient range became available; he obtained airmail contracts with at least nine different Latin American countries. An eight-day Paris—Buenos Aires airmail service opened in March 1928. The quickest way to send a letter from New York to Buenos Aires was by ship to Europe and then by Aéropostale.

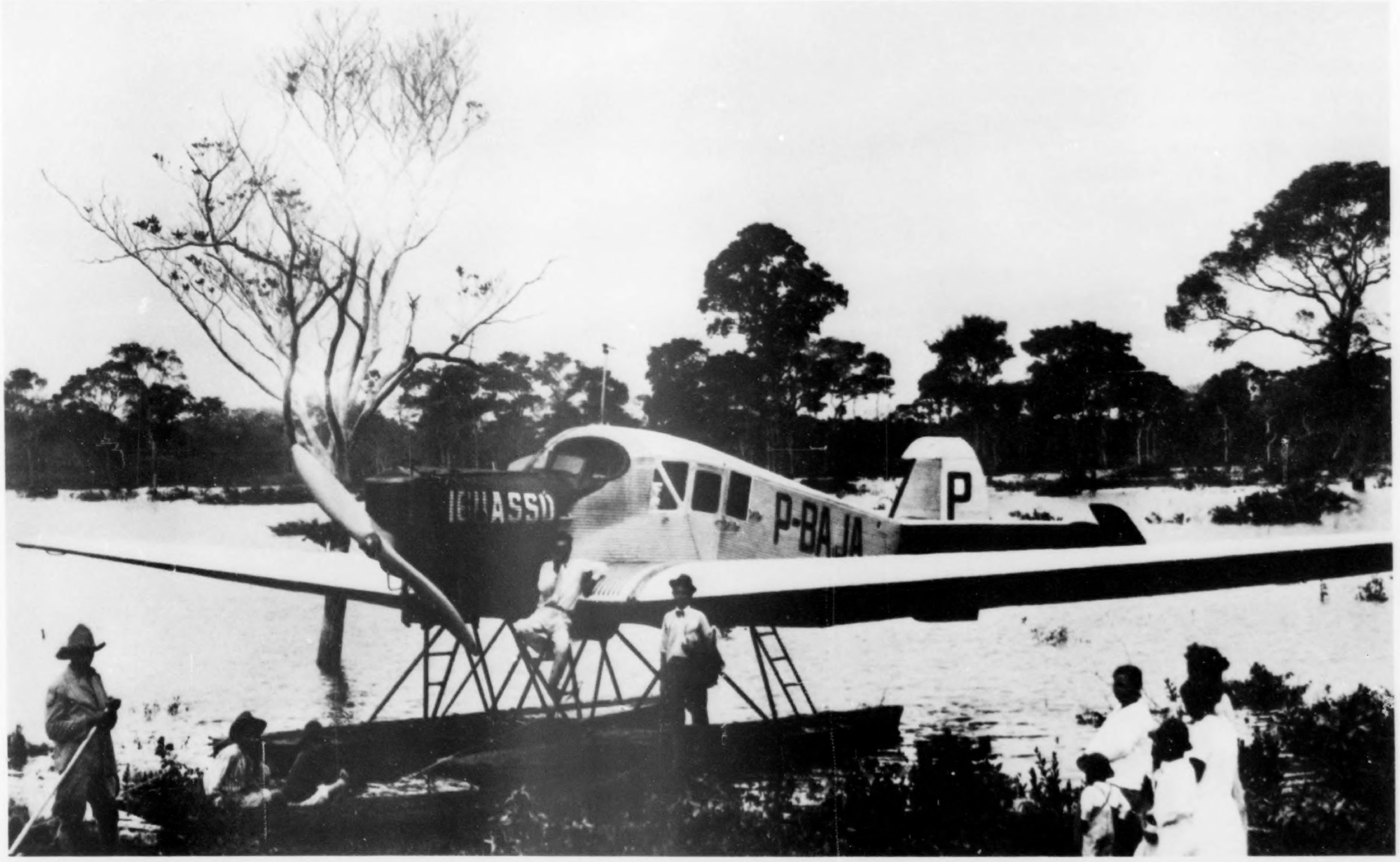
The U.S. had its 1934 air mail scandal. France had already been through one in 1931. Bouilloux-Lafont was reaching the full momentum of his program with airmail connections from Paris to almost every country in Latin America. Then, for reasons that have never been satisfactorily explained, the French Government astonishingly decided not to pay the substantial airmail subsidy for 1930. This deprived Aéropostale of the anticipated financial support upon which its existence depended, and Bouilloux-Lafont, who had sunk his considerable fortune into the airline, was suddenly bankrupt.

The tragedy for France was that Bouilloux-Lafont had just pulled off an aviation coup. In an international agreement with Portugal in 1930, he was granted exclusive landing rights in all Portugese territories, including the Azores, the key to the North Atlantic.

After Bouilloux-Lafont's airline empire collapsed, Air France took over the trunk route to Buenos Aires. But the precious Portugese agreement was allowed to lapse, and the North Atlantic mail route was left for the United States, Great Britain, and Germany to develop.

Carrying airmail continued to be the most important objective. Great ingenuity was shown by the Germans. By stationing specially equipped depot ships halfway across the South Atlantic, their mail-carrying Dornier Wal flying boats alighted, were refueled, and then launched by high-powered steam catapults. These catapults had been tested on the liners *Bremen* and *Europa*, from which mail-carrying planes were launched to save a day in mail transit.

German-built Junkers commercial aircraft made a substantial contribution toward the establishment of airlines in Latin America. One of these, the Brazilian Syndicato Condor Ltd., was founded on December 1, 1927, in Rio de Janeiro. One of its diminutive F 13 floatplanes, Iguassú, *for example, is seen on one of the inland waterways of Brazil in 1928.*



This procedure enabled the Germans to compete on equal terms with the French, and for some years Germany also had the giant dirigible, the *Graf Zeppelin*, to supplement the flying boats. But it operated less frequently, so that the trusty Wals continued to bear the main burden of carrying mail. Subsequently, Deutsche Luft Hansa and Air France recognized the merits of operating in partnership to provide a mail service that was both regular and frequent.

After an inexcusable show of apathy, the British finally began to catch up with the fine Short flying boats which, however, were woefully short of range: they had been built to serve the British Empire in the Eastern hemisphere. Other transatlantic efforts led to the bizarre Short-Mayo composite aircraft, a meaningless innovation already redundant in view of the Germans' success with surface-based catapults.

Shortsighted in their recognition of the importance of air communication with the American part of the English-speaking world, the British could not be faulted for their efforts to link their empire. There were two main arteries. One followed the "all-red" route to South Africa—so called because all the British colonies and possessions were colored red on the map. Airmail service from London reached Cape Town in January 1932, taking 11 days. Passenger service was added within a few months. At that time the journey required 33 separate stages and 6 changes of vehicle including two segments by train.

As an extension of the original India Air Mail, which opened in 1929, the other route was directed towards Australia; mail took 7½ days from London to Karachi, then part of British India. Singapore was reached in 10 days by Christmas 1933. The route to Australia was finally inaugurated a year later, with the mail taking 12 to 14 days.

Imperial Airways was shaken out of complacency by the Dutch airline K.L.M., which had carefully planned mail and passenger service to its empire in the East Indies. A twice-monthly service from Amsterdam to Batavia began in 1929. In October 1931, K.L.M. started full mail and passenger service to Batavia, the Fokker F–XII completing the journey in 10 days. In September 1933 K.L.M. offered full service to Singapore, seven months before Imperial.

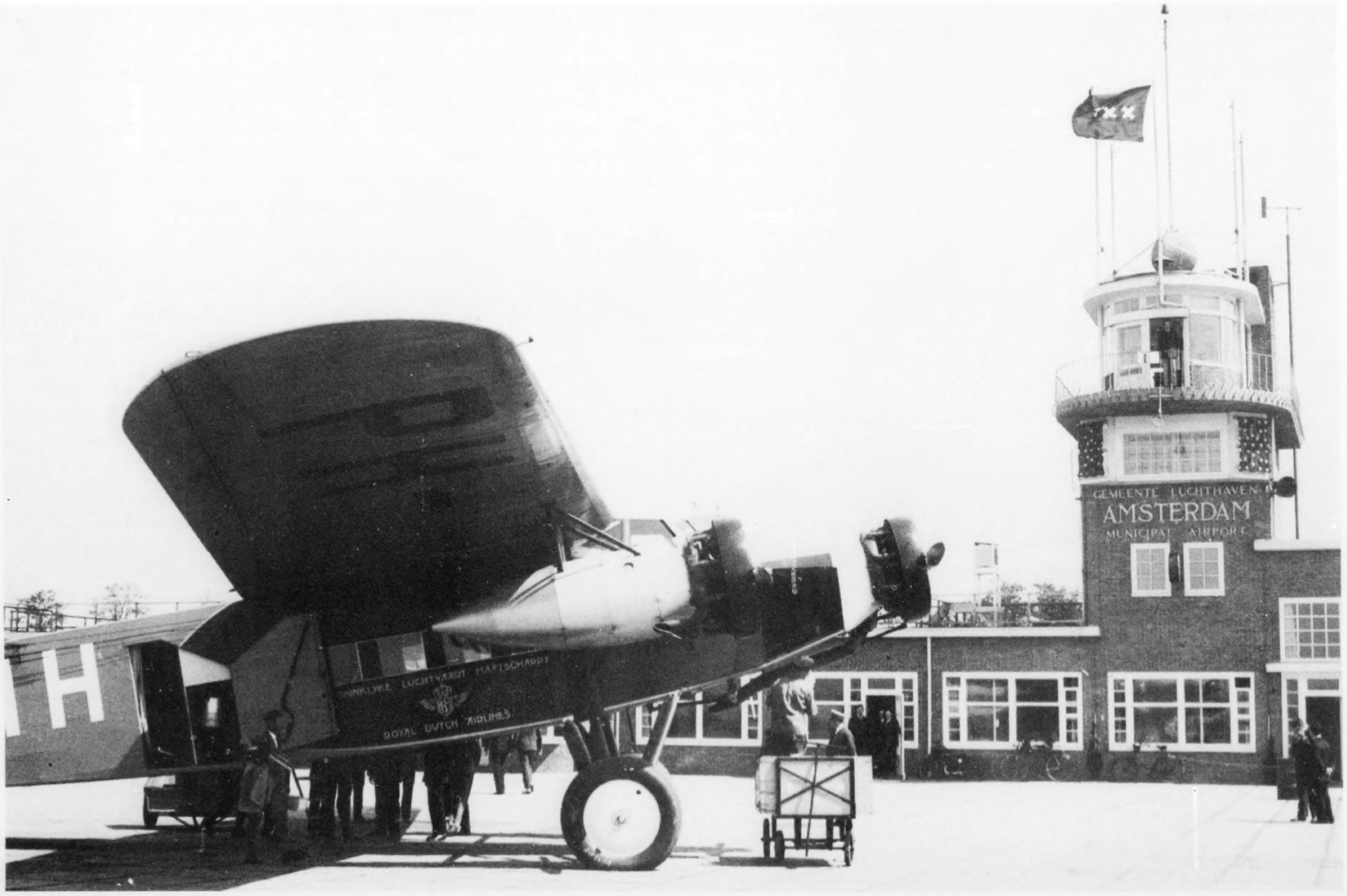
But 1934 was the watershed year, as events tumbled over events in the commercial air development calendar. Finally abandoning Fokker as its supplier of aircraft, K.L.M.'s Dr. Plesman entered a Douglas DC–2, the latest product of the American industry, in the England-Australia Air Race. To the amazement of the entire aeronautical world, the fully loaded DC–2 came in second, ahead of all except one of the thoroughbred racing planes.

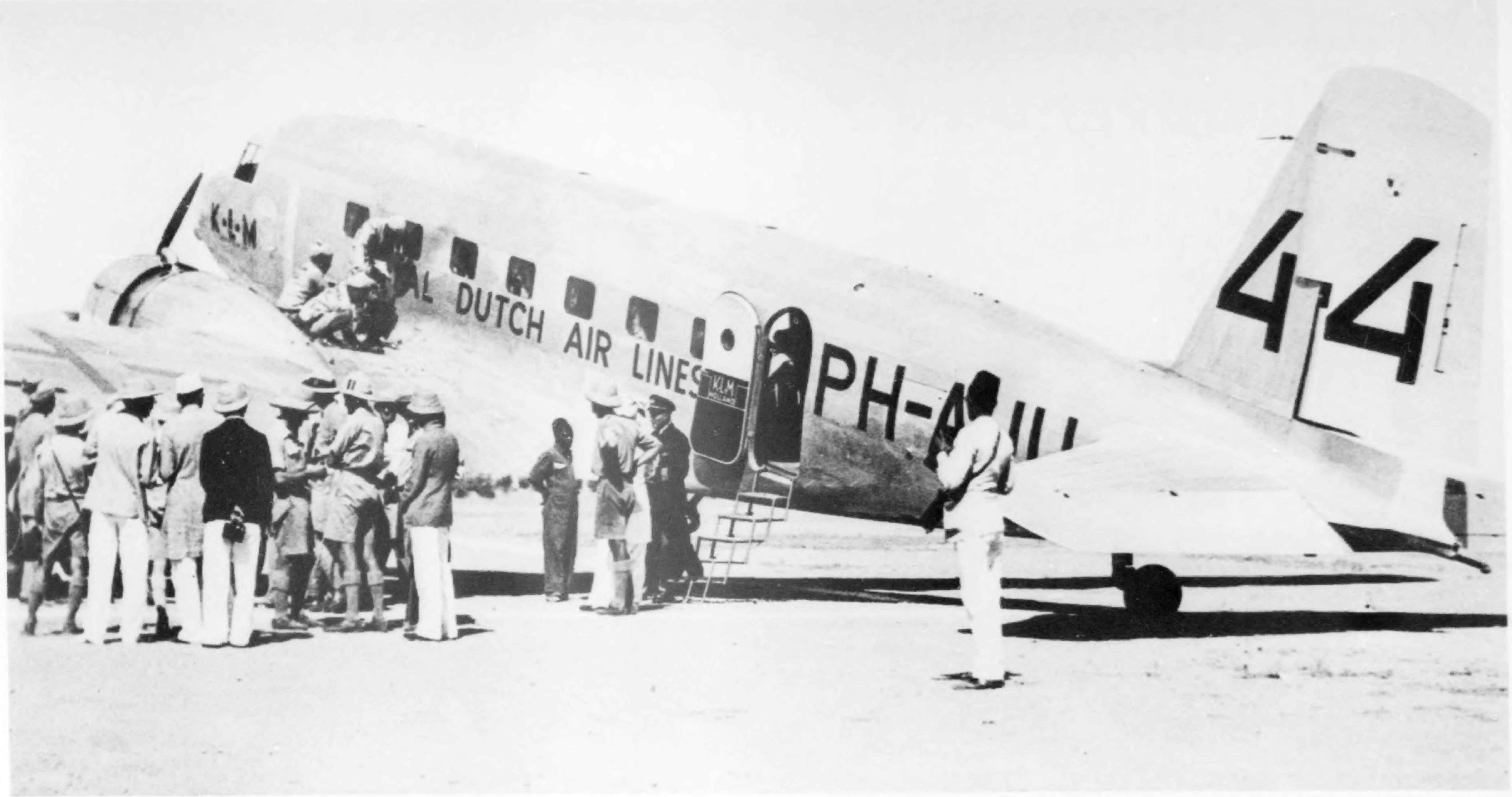
By June 1935, K.L.M.'s DC-2s, operating twice a week to Batavia, on a 6-day schedule, stirred Imperial Airways into action. In a two-pronged thrust, the British first announced the Empire Air Mail scheme, by which all airmail within the Commonwealth would be dispatched by air at a subsidized rate, then complemented this move by ordering a large fleet of the spacious Short flying boats to carry both mail and passengers.

The Empire Mail Scheme was inaugurated in February 1938, and for the first time K.L.M. faced a serious challenge from Imperial, even though DC–3s had replaced DC–2s. For about a year-and-a-half, the rivalry was intense, with both airlines providing Europe-Australia service in eight or nine days.

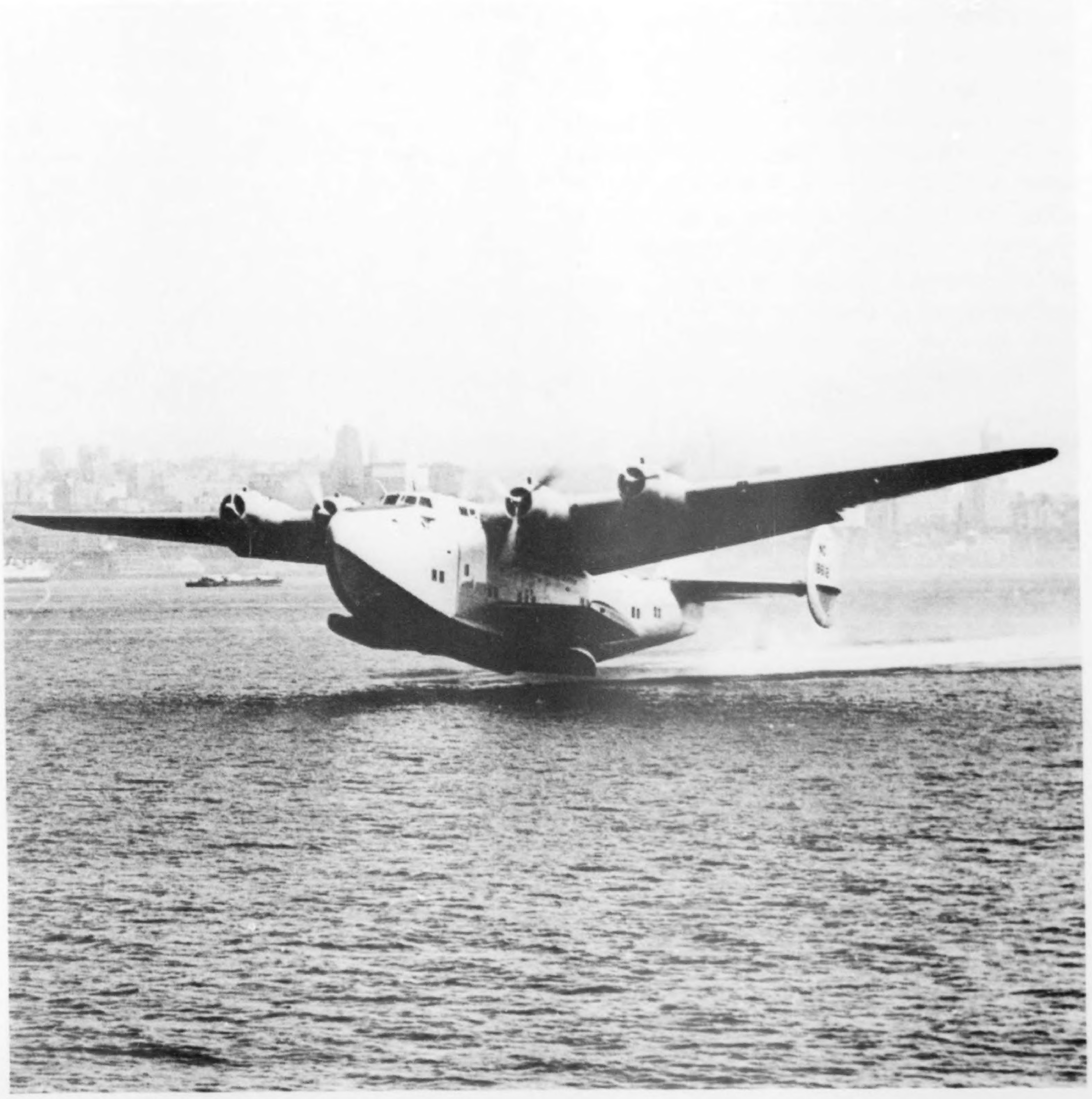
Other European nations also introduced important intercontinental mail and passenger service during the 1930s. The Belgian SABENA echoed K.L.M.'s colonial achievement by opening service from Brussels to Léopoldville, in the Belgian Congo (now Kinshasa, in Zaire) in 1935. In 1936 the French and the Belgians cooperated in a joint African

One of the great builders of transport aircraft in Europe during the early developmental period was the Dutch Fokker Company. This K.L.M. F.XII, fitted with four luxury seats for long-distance travel, inaugurated regular airline service from Amsterdam to Batavia (now Jakarta) in 1931.





Possibly the greatest single air event of all time was the England—Australia Air Race of 1934. Although won by a specially built de Havilland racing plane, most of the honors went to the K.L.M. DC–2 Uiver *which, with a load of passengers and mail, had the effrontery to come in second—ahead of all other competitors, including many other racers. Subsequently, the world beat a pathway to Douglas' door.*



After a decade of patient and innovative experimental flying by five countries contesting the North Atlantic air route, the honor of scheduled service inauguration finally went to Pan American Airways in 1939. The fine Boeing 314 flying boat was the first to be able to carry an adequate payload for sufficient range to ensure regular, uninterrupted flights.

mail service, serving their colonies en route to Madagascar (now Malagasy Republic). Air France had maintained the Aéropostale service to South America and had also inherited the Far East route (begun by Air Orient in 1931) with a 10-day mail service from Marseilles to Saigon.

By this time, Pan American, heavily supported by exclusive U.S. mail contracts, had conquered the Pacific, opening mail service to Manila in 1935, with the Martin M.130 "Clippers"; this followed a series of survey flights with the Sikorsky S–42—developed in 1934 for Pan Am, and as much ahead of its time in the world of flying boats as the DC–2 was in landplanes. Then, in 1939, with the Boeing 314s, Pan Am conquered the Atlantic.

The 1930s had been an astonishing decade for air transport. When it began, not a single transocean route or long-range intercontinental service existed. In every case—transpacific, transatlantic, trans-Africa, trans-Asia—the inspiration had been airmail.

As late as 1932 all intercontinental airline service was still embryonic. But by 1939 the entire world was linked by a comprehensive system of regular air routes. During that seven-year period, airmail service to the four corners of the Earth had been the main objective. And airmail subsidy—from every nation involved in seeking the elusive goal of rapid global communications—was the main stimulant for development and indeed paid for the passengers who followed the mails. But for the airmails of the 1930s, intercontinental passenger service might well have been delayed until after World War II. ■

Ocean Conquest: The Thoroughbred Propeller Airliner

Jay Spenser
Curatorial Assistant
Department of Aeronautics, NASM

One of the most nostalgic periods in commercial air travel was the heyday of the propeller airliner. From the end of World War II until the advent of jets in the late 1950s, these workhorses whose engines droned so reassuringly fulfilled the dream of scheduled airline service across the oceans. They embodied technological advances brought about by accelerated wartime development and were themselves constantly improved until the turbojet engine made them instantly obsolete.

Aviation from the start was dominated by the dream of ocean crossings. The seas were among the many barriers that pilots faced. They could only be crossed by ship, and passages were slow and occasionally arduous. The invention of the airplane brought a glimmer of promise that mankind might one day be able to fly over the ocean, unhindered by its many moods. The worldwide acclaim accorded Louis Bleriot, who flew a heavier-than-air craft from France to England in 1909, showed just how popular and universal this dream was. But the airplane of the day was small, fragile, and unreliable, and the English Channel was insignificant when compared to the awesome expanse of the Atlantic.

Ten years later, six men in a four-engine Curtiss flying boat called the NC–4 did cross the Atlantic ocean, but their wood-and-fabric biplane had to make stops, and the hazardous crossing took 15 days! Two other similar flying boats did not make it, although their crews were rescued. Later in 1919, British fliers Capt. John Alcock and Lt. A.W. Brown successfully flew a converted World War I Vimy bomber nonstop from Newfoundland to Ireland.

Before either record flight took place, a young aviator in the U.S. Navy made a prediction that proved him to be a visionary. Ensign Juan Terry Trippe proclaimed transoceanic flight "a perfectly safe and sane commercial proposition, not a gigantic gamble." Trippe, later the founder of Pan American World Airways, went on to become one of the most influential individuals in the history of air transport.

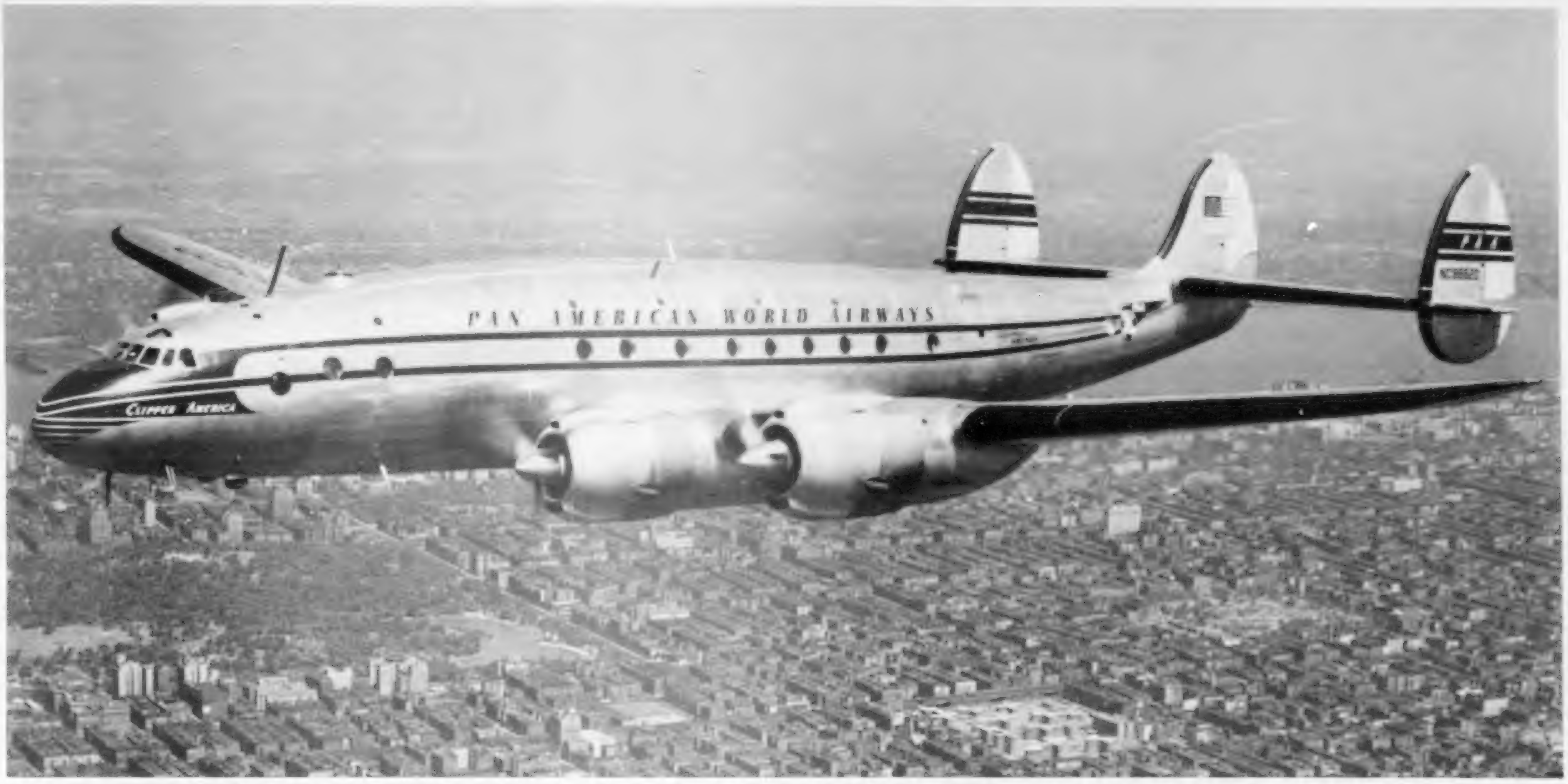
While the dream of passenger travel over the oceans was strong, technology limited its instigation. Germany pioneered in the development of metal aircraft structures, but such aircraft were initially too small and heavy to allow long-distance commercial travel. Engines also lagged behind the needs of air transportation, both in power output and reliability. Then in 1926 there appeared the 220-horsepower Wright J5 Whirlwind radial engine, the first truly reliable aviation power plant.

Among those aircraft fitted with the Whirlwind was a slender silver monoplane christened the *Spirit of St. Louis.* Charles A. Lindbergh, alone in the Ryan monoplane for 33½ hours, became the first person to fly nonstop from New York to Paris in May 1927. The reaction around the world was electric; another major goal on the road to the realization of worldwide commercial air travel had been realized, and suddenly everyone was "air-minded." The coming years were filled with record flights across the oceans and with newspaper headlines filled with reports of higher and farther flights. Typical of these was the first nonstop flight across the Pacific in 1931 by Clyde Pangborn and Hugh Herndon, who flew from Japan to the U.S. in the Belanca monoplane *Miss Veedol.*

Other less sensational advances also contributed to the realization of the dream. The legendary pilot Jimmy Doolittle successfully demonstrated the first flight of an airplane performed entirely on instruments in 1929, culminating long months of work at the Guggenheim Blind Flight Laboratory in the development of new instruments and procedures to allow planes to operate

The giant, four-engine Douglas DC–6 Flagship California *of 1947 was a stretched and pressurized development of the DC–4 with seating for up to 68 passengers.*

AMERICAN AIRLINES
FLAGSHIP CALIFORNIA
NX90702
AA



Perhaps the most graceful airliner of all was the Lockheed L. 749 Constellation of 1947. Flying high over Central Park, Pan American World Airways' Clipper America *soared over mid-Manhattan as it prepared for history's first globe-girdling airline service. It took off from La Guardia Field, N.Y., on June 17, 1947.*

safely in all weather conditions. Eight years later, the U.S. Army Air Corps tested the Lockheed XC–35, the first pressurized plane to fly. It incorporated years of work on superchargers and high-altitude flight testing. Pressurization was important if airliners were one day to fly at high altitudes where less air resistance allowed higher speeds.

Although the necessary elements were coming together, conditions in the 1930s did not allow more than limited success to those pioneers of commercial air travel. Because of the absence of airports and support facilities for land planes, the seaplane was initially chosen as the long-range airliner. The most successful operator was Pan American Airways with its famous Sikorsky, Martin, and Boeing "Clipper" flying boats. Juan Trippe opened up routes to places as far away as China, but demand for the extremely expensive passage was so low that it did not fully represent the dream of airline travel for the masses. It was a luxury service available only to the wealthy and to corporations that placed a premium on more rapid travel. Great Britain also engaged in ambitious airboat operations with its Empire-series Short flying boats. Germany developed the 12-engined Do–X flying boat for transatlantic operations, but this ungainly craft proved to be both too underpowered and short-ranged to provide useful passenger service.

Only at the end of the decade did a new generation of airliners emerge that might have been successful had not World War II intervened. The Focke-Wulf Condor of 1937 and the Boeing 307 of 1938 were both four-engine land planes of advanced design.

Douglas airliners were certainly the most significant transports before and during World War II. The Douglas DC–3 appeared in 1936 and revolutionized the airline industry around the world. The first airliner to make a profit for its operators without a subsidy, it carried 21 passengers. It was nevertheless too slow and short-ranged to be considered for ocean routes, and two engines offered less safety than four when vast stretches of water were to be covered.

After constructing the DC–4E, an unsuccessful prewar prototype, Douglas produced a more conservative four-engine airliner under theDC–4 designation. Powered by 1450 horsepower radial engines and seating 44 people, the new DC–4 was intended for one-stop coast-to-coast operations. The U.S. was already at war before it first flew in February 1942, however, and the type was instead used largely as a military cargo transport. In this role, the C–54 (the military version of the DC–4) made about 80,000 Atlantic crossings and greatly influenced the British and European aviation industries, which were already planning to build a new generation of airliners in the immediate postwar period.

American dominance of the air transport industry was ensured by the Lockheed L.049 Constellation, which entered transatlantic service with Pan American, Trans World, and American Overseas Airlines early in 1946. A classic design with its distinctive triple tail and sleek greyhound lines, the "Connie" carried a third again more passengers than the DC–4, was pressurized, and—with a cruise speed of 434 km/hr (270 mph.)—was fully 113 km/hr (70mph.) faster than the Douglas. Most U.S. airlines had supported the development of the DC–4, but TWA under the leadership of billionaire industrialist Howard Hughes had instead backed Lockheed's advanced proposal with an order for nine L.049s in 1940. The first Constellation flew in January 1943, and relatively few were operated by the military during the war. The qualities of this new airliner were not truly appreciated until it entered commercial service.

It was on the critical North Atlantic route that the Constellation played its most important role. This was the single international air route where high revenues could be generated, and those airlines using the "Connie" found they had an advantage. Public acceptance of the plane, with its speed, pressurized comfort, and relatively low noise level, as well as its aesthetic appeal, was immediate and enthusiastic.

Competition was soon forthcoming from the Boeing Aircraft Company of Seattle and the Douglas Company of Santa Monica, California. Boeing's entry appeared first on the scene and represented a great departure from the elegance of the Lockheed Constellation. This was the Boeing 377 Stratocruiser, a civil counterpart to the military C–97 transport.

Douglas' response to the challenge was the DC–6. It later developed into the DC–6B, the most successful four-engine piston airliner of all. It featured a stretched cabin and greater seating capacity, more powerful engines, and a greater range than the DC–4, which allowed it to operate nonstop between New York and Los Angeles. Even more

288625
TWA
TWA
TW

powerful engines and yet more stretching led to the DC–7, but noise and vibration levels were excessive, and it suffered in popularity as a result. The DC–7C "Seven Seas" was the solution with 1.5-m (5-ft.) extensions in each wing root moving the engines farther out and allowing more fuel capacity. The DC–7C was a milestone airliner because it was the first to have sufficient range to operate nonstop between New York and European capitals even in adverse wind situations.

The Lockheed Constellation also evolved through progressive versions, each larger and longer-ranged than the one before. The "Connie" became the Super Constellation and finally the Starliner. This last version had an entirely new wing and entered service in mid-1957.

The sleek Bristol Britannia, a four-engine turboprop carrying well over 100 passengers, also entered service on the London to New York run in 1957. The first turbine-powered aircraft to operate over the Atlantic, the Britannia might have captured a significant share of the market had it been introduced earlier, but delays experienced after its first flight in 1952 prevented its arriving on the scene until a year before the advent of the jets. Boeing's revolutionary 707 would make the Britannia, the Starliner, the DC–7C, and Boeing's own Stratocruiser obsolete overnight.

The commercial air transport industry had made two significant changes by this time: first, improvements in aircraft performance and navigational techniques allowed time-saving great circle routes over arctic regions. Second, the DC–6 had led the way in high-density coach-class seating, reflecting a change in the basic nature of modern air transportation; the airliner was no longer a luxury craft catering to the needs of a few but rather a practical machine serving a broad market. The real cost of international air travel had dropped so dramatically that millions could now afford to conquer the oceans in pressurized comfort. However, such travel was becoming more a pragmatic routine than a romantic adventure, and with the coming of transatlantic jet service, the deep drone of piston engines soon became a thing of the past. ■

Top: The Bristol Britannia, a British turboprop, entered service in 1957. The advent of jetliners like the Boeing 707 prevented it from gaining greater acceptance.

Center: Boeing 377 Stratocruisers, civil airliner versions of the military C–97 transport, were popular with passengers because of a lower-deck cocktail lounge.

Bottom: World War II interrupted the career of the Boeing 307, the world's first pressurized airliner. It had many advanced features although it was obsolete when the war ended.

The First Four Decades of Jet Aviation

The world's first gas turbine jet-powered aircraft, Germany's Heinkel HE–178 V–2—on August 27, 1939, test pilot Erich Warsitz became the first man to fly a jet.

Tim Wooldridge
Curator
Department of Aeronautics, NASM

On August 27, 1939, just four days before World War II, Heinkel test pilot Erich Warsitz climbed into the experimental He 178, taxied out to the runway at Marienehe Airfield, and in several seconds and a few thousand feet of takeoff roll, became the first man in the world to fly a turbojet-powered aircraft.

When Warsitz made his memorable first flight in 1939, Germany became the first country to enter the jet age. With great fanfare, Italy became the second nation to fly a jet-powered aircraft when the Caproni Campini N. 1, with its unusual combination of piston engine and ducted-fan compressor, flew on August 28, 1940. Although the aircraft was jet propelled, the lack of a conventional turbojet engine severely restricted aircraft performance. Great Britain finally capitalized on Frank Whittle's persistent efforts when the Gloster E. 28/39 flew on May 15, 1941, powered by his W.1 engine that had been derated from 562 kg (1240 lb.) thrust to 390 kg (860 lb.) for the flight trials. The U.S. would not make the transition from propeller to jet for another year.

Despite the growing Allied concern over turbojet development, Germany led the way in almost every phase of jet propulsion. The He 178, which did not enter production, was only the precursor of many jet-propelled fighters, bombers, and missiles.

The turbine-powered fighters that were rushed into production by the warring powers had a negligible effect on the outcome of the war; however, the period did mark the emergence of the jet engine as the primary source of aircraft power. As the war ended, the stage was set for a dramatic improvement in aircraft performance.

Centrifugal-compressor engines based on the Whittle design improved in reliability and power output. Eventually the centrifugal-flow engine gave way to the more streamlined axial-flow design, and engine thrust grew in proportion as U.S. and British engineers developed more sophisticated techniques of turbojet engine design and production. The list of technological accomplishments was impressive: improved alloys, dual compressors, variable incidence stators and exhaust nozzles, afterburners, and air-cooled turbines. Engine thrust changed dramatically from the 454-kg (1000 lb.) thrust class of the early experimental Whittle and von Ohain engines. By the end of the decade, the prototype of the Pratt & Whitney JT3 (J57) engine was running and would eventually produce 6804 to 8165 kg (15,000 to 18,000 lbs.) of thrust with afterburning.

The enormous increases in engine performance that followed the war provided incredible challenges for the airframe manufacturers. As aircraft speeds increased, the aerodynamicists found that the conventional shapes and concepts that had served them well for decades were now obsolete, and new, imaginative designs were required. Improving on German technology developed during the war, American aeronautical engineers kept pace with their fellow designers in the propulsion business. Wing shapes began to change. Delta wings, extremely thin wings, and swept wings appeared, many with varied slats and flaps to provide adequate low speed flight characteristics for aircraft design for high speeds.

Because Great Britain also pioneered in the development of gas turbine engines before and during the war, it was quite appropriate that it would lead the way in adapting jet propulsion to commercial aviation. The first tentative step toward fast, comfortable, and quiet air travel was taken on July 16, 1948, when the Vickers-Armstrong Viscount made its maiden flight. Powered by four Rolls-Royce Dart turboprop engines, the Viscount eventually proved to be a popular choice, both at home and abroad; about 440 of them were sold.

The second significant design to appear in the immediate postwar era was the four-engined de Havilland Comet 1, which made its maiden flight on July 27, 1949, from Hatfield, England. It was the world's first pure jetliner, and though the aircraft was destined to experience severe setbacks during its intermittent service life, it was the first to give passengers the unaccustomed speed and comfort of jet flight. Great Britain had the lead, but it was to be short-lived.

The "Golden Age of Aviation," 1927-1939, was an era of remarkable technological advances, classic aircraft, charismatic personalities, and record-breaking flights so frequent that they seemed like daily occurrences. Measured against these same criteria, the decade of the 1950s could properly be called the "Golden Age of *Jet* Aviation."

The technology developed by Great Britain and Germany during the war, and subsequently complemented by U.S. research and development efforts, became the foundation for an unprecedented revolution in the field of jet propulsion. Despite Great Britain's early lead in the field, by the mid-1950s the U.S. had made significant progress in the development of new concepts and technology related to propulsion and structural design. By 1958, with the Boe-

Boeing president William M. Allen decided to gamble a considerable portion of the company's funds on the premise that the "jet was right" for commercial aviation. The Dash Eighty*, Boeing's 707 prototype, became the first U.S. jetliner. It was to demonstrate the feasibility of a jet-powered military tanker transport as well as a commercial airliner. It first flew on July 15, 1954.*

ing 707 in regular service, the U.S. was securely in the lead in providing safe, fast, and comfortable travel on a worldwide basis. Equally impressive was the evolution of military aircraft with increasing standards of performance and sophistication.

The British had introduced jet propulsion to commercial aviation in the late 1940s with the turbojet-powered Comet 1 and the turboprop Viscount. With justifiable pride and considerable anticipation, British Overseas Airways Corporation inaugurated the first jet passenger service between London and Johannesburg with the Comet 1 on May 2, 1952. However, tragedy struck when a Comet 1 exploded in flight on January 10, 1954. The cause was found to be metal fatigue (weakness in the metal resulting from prolonged stress) and it was not until October 4, 1958, that an improved Comet 4 began the first transatlantic service by jetliner.

In the meantime, however, the U.S. aviation industry took the first giant step that would put it firmly in the lead in the field of commercial jet aviation. On July 15, 1954, Boeing's "Tex" Johnson flew the model 367-80, called the *Dash Eighty*, prototype of the Boeing 707.

The aircraft had its genesis in the 1940s and sprung from the technological base established by the B–47 and B–52 bombers. Encouraged by the success of the bomber program, Boeing president William M. Allen decided to gamble a considerable portion of the company's funds on the premise that the "jet was right" for commercial aviation. In 1954, there evolved the famous *Dash Eighty*, a prototype that was to demonstrate the feasibility of a jet-powered military tanker transport as well as a commercial airliner. Following military orders for the KC–135 tanker version, Boeing received a Pan American order for the commercial 707 in late 1955—and the Boeing family of jetliners went into production.

The Boeing 707 did not begin transatlantic service with Pan American World Airways until October 26, 1958, three weeks after its British competitor. Eventually, however, the superior performance and adaptability of the 707 and its many variants that would appear over the next two decades resulted in its use by virtually all of the world's major airlines. Competition appeared first in the form of the Douglas DC–8, and later the General Dynamics 880/990 jetliners, none of which had the flexibility of the many Boeing models to meet varying airline requirements.

The appeal of the short-haul jetliner was demonstrated by the French Sud Aviation (Aérospatiale) SE 210 Caravelle, the first short-ranged transport powered by turbojet engines. The unique rear-engine configuration became popular, leading eventually to similar three- and four-engine arrangements by many of the world's manufacturers.

The turboprop transport became ideally suited for feeder routes, commuter airlines and corporate and business use. Equipped with twin Rolls-Royce Dart engines, the Fokker F27 *Friendship* first flew on November 24, 1955, and went on to become the best-selling turboprop airliner produced outside the Soviet Union.

As the decade drew to a close, the revolution in commercial jet aviation was just beginning. In the 1960s, the introduction of wide-body jetliners, supersonic airliners, and enormous turbofans offering increased thrust, reduced noise, and better fuel efficiency led to a dramatic change in commercial jet aviation.

Following the example set by the French Caravelle in the 1950s, the British produced the Hawker Siddeley Trident, the first rear-engined "tri-jet," in January 1962. Six months later came the four-engined British Aircraft Corporation VC–10, the first intercontinental jetliner to use the rear-engined configuration, followed shortly thereafter by a similar Soviet design, the Ilyushin IL–62.

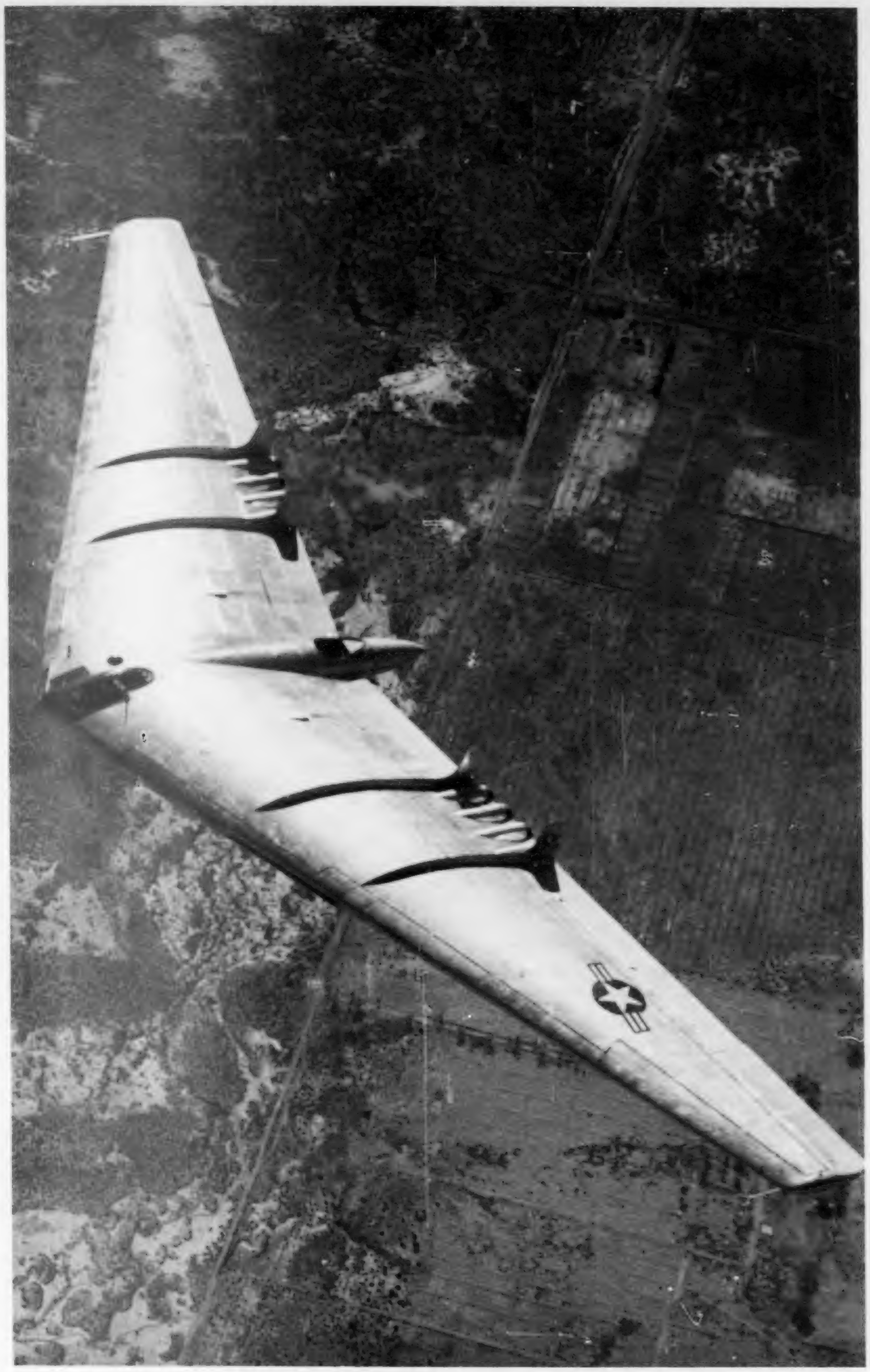
The VC–10 was powered by the Rolls-Royce Conway engine, the first "by-pass" or turbofan engine to enter regular airline service. Using a concept patented in 1936 by Frank Whittle, the Conway turbofan engine was the first of a new breed of quieter, more efficient engines that eventually replaced turbojets in most large jetliners and many similar civil and military aircraft.

It fell once again to Boeing to continue the domination of the commercial market that began with the model 707. In 1963, a Boeing design emerged that would become the world's most successful jet transport. Similar in design to the British Trident but significantly longer, the Boeing 727 was offered in various configurations, following the example set by the 707. By 1978, sales totaled 1500, and it was in service with 85 airlines.

In 1969, Boeing won yet another battle for the world's passenger and freight market. The first of the so-called "wide-body" jets, the Boeing 747, made its maiden flight, becoming the largest airliner in the world. Powered by four mammoth Pratt & Whitney JT9D turbofan engines generating over 22,680 kg (50,000 lbs.) of thrust each, the "Jumbo Jet" came in many configurations, one of which could carry 498 passengers.

Few commercial aircraft programs of the jet age were as controversial as the supersonic transport (SST). The Soviet Union became the first nation to build and fly an SST, the Tupolev TU–144, on December 31, 1968. The Anglo-French Concorde flew on March 2, 1969, the result of more than six years of joint development and production by the British Aircraft Corporation and the French airframe company, Aérospatiale. The Concorde became the first SST to operate regularly scheduled passenger service, beginning in January 1976. Crossing the Atlantic at twice the speed of sound became quite popular with businessmen who considered the savings in time well worth the one-way fare of almost $1200 in 1980.

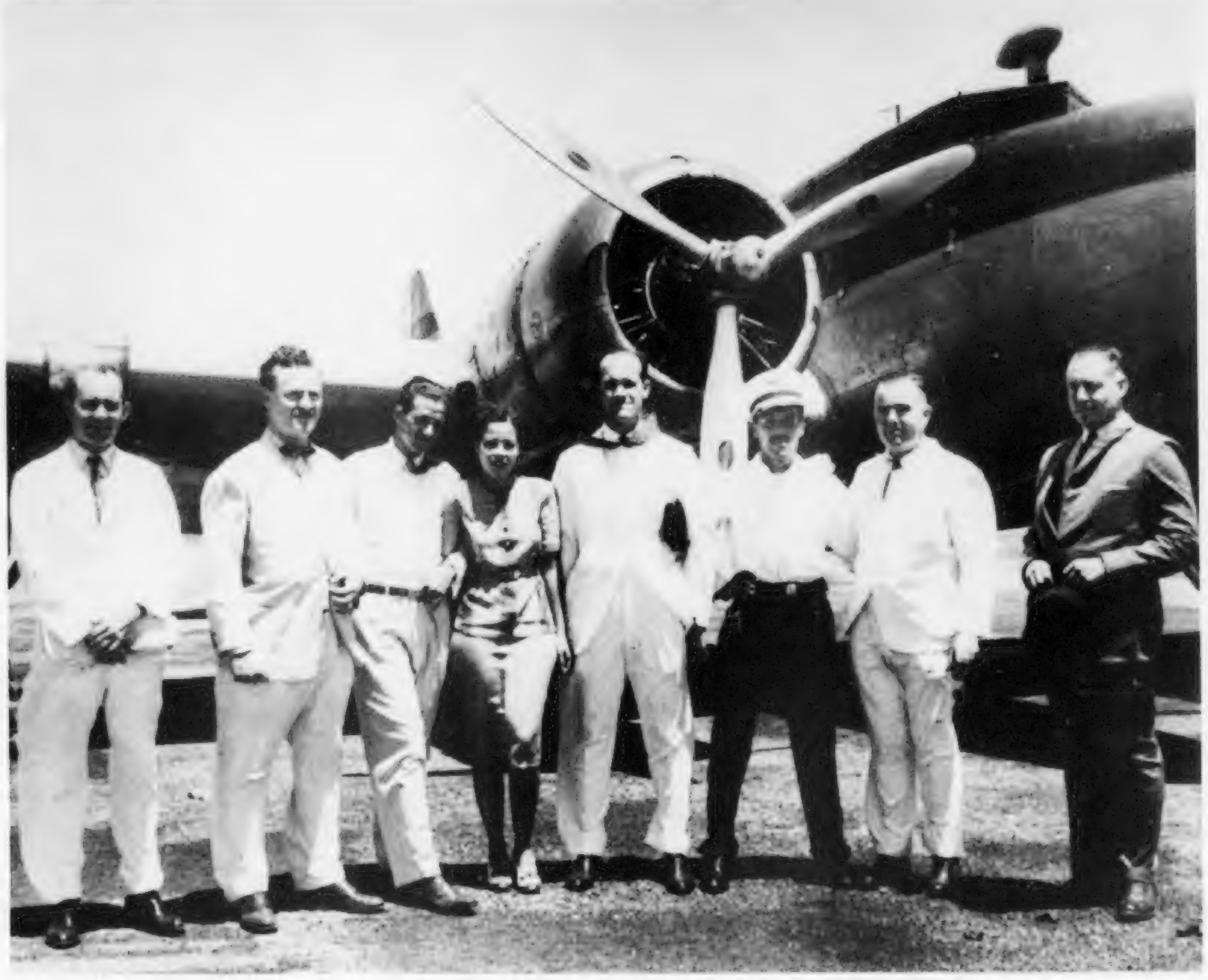
Because of the rising costs of aircraft production, international cost-sharing and cooperation became an accepted way of doing business in the 1970s. In May 1974, the first European "wide-body" jetliner, the A300 Airbus, entered service as the first product of an international partnership. Production of the airplane was shared by manufacturers from five countires.



The U.S. Air Force's 100-ton Northrop Flying Wing YB–49 jet bomber is shown traveling at high speed. It gives little indication of its enormous size with 90,720 kg (200,000 lb.) distributed along the sleek wing. Dwarfing the wartime heavyweight bombers such as the B–29s and B–32s, the Flying Wing could travel at speeds in the 805-km/hr (500-mph.) class and could pack over 13,608 kg (30,000 lb.) of bombs. Its clean design helped make it the longest-ranging jet airplane in the world. Eight jet-engines gave it 32,000 sustained horsepower—more than was carried by any other airplane.

With the wonderful mobility introduced by the de Havilland Comet and Boeing 707 came the inevitable side effects—noise, pollution, airport congestion, sonic booms, and much more. Gradually, however, the air transportation system changed and adapted. Today, and for the foreseeable future, there is a new threat to the stability of the system—soaring fuel costs. Now, fuel economy is an overriding consideration in engine and aircraft design. Active controls, composite structures, winglets, supercritical wings . . . an entire new vocabulary is evolving to describe the inovations that will shape the jetliners for the next 40 years of jet aviation. ■

Blacks in Commercial Aviation



James O. Plinton, Jr. (third from right) and business partner Maurice DeYoung (second from left) gather with dignitaries in front of Quisqueya Ltd.'s Boeing 247D in 1948. Quisqueya was the first airline to serve the Turks and Caicos Islands.

Dominick Pisano
Associate Curator
Department of Aeronautics, NASM

The economic revolution in American commercial aviation brought about by the introduction of the Douglas DC–3 did not extend to blacks who found themselves systematically excluded from participating as employees in the burgeoning air transport business. Having traditionally held service jobs as Pullman porters, blacks discovered that with the advent of passenger travel by air, they could only be hired as skycaps and ground handlers. More substantial jobs such as commercial pilot, aircraft mechanic, or flight attendant were unavailable even to those who were qualified to perform them. By 1940, only a few short years after commercial aviation had become a prospering business, a scant 3.3 percent of a total of 23,175 air transport industry employees were black, and most were service workers.

Blacks were not only barred from responsible employment in commercial air transportation. They also suffered from a distinct lack of exposure to the aviation world. Before they could even begin to obtain jobs in the air transport industry, blacks had to be trained as pilots and aircraft technicians. Prior to the pre-World War II Civilian Pilot Training Program (CPTP), this was barely possible. Only two sustained efforts to train black pilots are known to have existed before CPTP—the Cornelius R. Coffey School of Aeronautics in Chicago and the Bessie Coleman Aero Club in Los Angeles (operated by William J. Powell).

Designed to provide a pool of civilian pilots who would be available to the military in time of national emergency, the Civilian Pilot Training Program offered many blacks the opportunity to fly, but on a segregated basis. Located at predominantly black schools such as Howard University and Tuskegee Institute, CPTP contributed greatly to the increase in black pilots available prior to the war.

As a result of the Civilian Pilot Training Program, pressure was brought to bear on the Army Air Forces to allow blacks to participate in a military flight training program. Tuskegee Institute was selected for pilot training, and Chanute Field, Illinois, was designated for training of ground crew personnel. During World War II, the number of blacks in the Army Air Forces increased dramatically; from September 1942 to June 1945 the total of black officers and enlisted men in the AAF jumped from 37,223 to 140,462. After the war, President Truman's Executive Order 9981, signed on July 26, 1948, did much to end the official policy of segregation in the military and thus make military avaiation careers available to black veterans of World War II, but it had little or no effect on racial policies in the air transport industry.

By 1950, no black pilots were as yet employed by a major scheduled airline, and there were no black flight attendants or cabin personnel. The only exceptions to the all-white rule were August H. Martin, a Tuskegee-trained military pilot, and Perry H. Young, Jr., a civilian flight instructor during the war. After he was discharged from the service in 1946, Martin took a job with Willis Air Service at Teterboro Airport, New Jersey, and flew part-time for Buffalo Skylines, El Al, and World Airways. Between jobs, he supported his family by working as a stevedore. In 1955, Martin was hired as a pilot by Seaboard World Airlines with whom he remained until his death in 1968. He was on vacation and was attempting to deliver supplies to war-torn Biafra during the Nigerian-Baifran war when the plane he was flying crashed.

After World War II, Perry Young decided that he wanted to remain in the aviation business. Because opportunities were scarce in the U.S., Young traveled to Haiti, where he took part in an abortive airline venture and subsequently flew as a plantation pilot. Later, Young took flying jobs with the Puerto Rican government, the U.S. Department of the Interior in the Virgin Islands, and KLM, with whom he had a small mail contract. Hoping to land a job as a pilot with a major airline, Young returned to the U.S. in 1956 but was forced to work as a flight mechanic with Seaboard World. His persistence eventually paid off. Having learned to fly helicopters in Puerto Rico, Young was hired by New York Airways, a scheduled helicopter airline that ferried passengers, cargo, and mail between eight suburban airports and a heliport in midtown Manhattan. Young later retired from New York Airways after 22 years and became chief pilot for New York Helicopter, a position he holds today.

Blacks were not only discriminated against in the cockpit, they were also barred from holding key administrative posts in commercial aviation. James O. Plinton, Jr., a pioneer black airline executive and former flight instructor at Tuskegee Institute during World War II, was undaunted by the prevailing mood of the industry. After the war, Plinton and an associate went to Latin America and helped reorganize ANDESA (Aerovias Nacionales del Ecuador), the national airline of that country. From Ecuador, Plinto went to Haiti, where he and fellow American Maurice DeYoung became partners in an airline called Quisqueya, Ltd. On March 14, 1948, Plinton landed Quisqueya's lone Boeing 247D on Grand Turk in the Bahamas, thus setting the stage for regular roundtrip commercial airline service from Port-au-Prince, Haiti, to the Turks and Caicos Islands via Kingston, Jamaica, Miami, and Nassau.

In 1957, a political revolution put an end to Plinton's Haitian adventure but not to his career in aviation. Plinton returned to the U.S. where he was hired by TWA as Executive Assistant Director of Industrial Relations and Personnel and later was named assistant to the airline's president, Carter Burgess. While in this post, Plinton was responsible for negotiating TWA's landing rights in East Africa.

In May 1971, Plinton left TWA to become Vice President for Special Marketing Affairs at Eastern Air Lines. Later, he became Eastern's Vice President for Market Development where he helped negotiate Eastern's acquisition of Caribbean-Atlantic Airlines (CARIBAIR). Plinton retired from Eastern in 1979 but is still very active in aviation, serving on the board of trustees for Embry-Riddle Aeronautical University in Florida.

Men like Martin, Young, and Plinton were the exception rather than the rule in post-World War II commercial aviation. This situation, however, was soon to change. In 1957, Marlon D. Green, a former Air Force captain with over 3000 hours in multi-engined aircraft, filed a lawsuit against Continental Airlines after he had experienced what he considered discriminatory hiring practices. For the next six years, Green sought vindication through the courts and in 1963 won a hard-fought victory when the U.S. Supreme Court ruled in his favor. Along with changing social attitudes, Green's case was the catalyst that enabled blacks to make significant strides toward breaking down racial barriers in the airline industry.

In the years that followed the Green decision, the cumulative effects of the integration of military aviation, the civil rights movement, the boom in air traffic, and federal intervention for equal employment opportunity brought about many important breakthroughs for blacks in the commercial airline industry. One of the benefactors of the change brought about during the 1960s was Warren H. Wheeler, president of Wheeler Airlines, a black-owned commuter carrier and cargo service at Raleigh-Durham Airport in North Carolina. Begun in 1969 with the help of funds from the Small Business Administration, Wheeler Airlines was established as part of a continuing program of economic development to provide air transportation to eastern North Carolina. During the first month of operations, Wheeler Airlines carried only slightly over 200 passengers, but business prospered and the airline now carries over 30,000 passengers yearly. Wheeler also offers a charter service on request and flies a bank courier service between Raleigh-Durham and cities in North Carolina and Virginia.

Perry H. Young, Jr., one of the first blacks to break into commercial aviation, stands in front of his New York Airways Vertol 44. The scheduled helicopter airline ferried passengers, cargo, and mail between eight suburban airports and a heliport in mid-town Manhattan.

Blacks in commercial aviation, however, realize that the success of men like Warren Wheeler is not the result of complacency. To safeguard the gains realized over the last three decades, insure that progress toward the hiring of additional black pilots in the industry continues, and promote the general interests of blacks in aviaton, the Organization of Black Airline Pilots (OBAP) was established in 1976. OBAP also serves the important function of getting young blacks interested in careers in aviation and, toward this end, has established a scholarship fund to promote expansion of the number of black commercial pilots in the U.S.

In spite of many obstacles, blacks have made significant advances in commercial aviation in the more than 30 years since the end of World War II and have achieved no small measure of success. Yet, their situation within the industry is still far from being completely resolved. It has been estimated that as of 1978 there were about 110 black commercial pilots flying in the U.S. And according to a 1979 U.S. Equal Employment Opportunity Commission report, only 8.1 percent of a total of 282,272 air transportation industry employees were black.

It is, therefore, apparent that the real chronicle of blacks in commercial aviation belongs to the future. That story is only now beginning to be told. ■

NASM Programs and Materials

As part of a continuing program of recognition of the contributions made by blacks in the field of aviation, the National Air and Space Museum opened on September 23, 1982, an exhibition called "Black Wings: The American Black in Aviation." Scheduled for February 1983, Black History Month, are a museum publication based on the exhibit, an educational filmstrip, and a symposium on black airmen in World War II.

Additional Reading

"Airline Pioneer." *Ebony*, November 1976, pp. 103ff.

"Black Airline Pilots," *Black Enterprise*, April 1974, pp. 15ff.

"First Black Airline Gets Off the Ground." *Ebony*, April 1976, pp. 44ff.

Strickland, Patricia, *The Putt-Putt Air Force: The Story of the Civilian Pilot Training Program and the War Training Service (1939-1944)*. Washington, D.C.: Federal Aviation Administration, [n.d.].

Northrup, Herbert R., et al., "The Negro in the Air Transport Industry." Report No. 23 in *The Racial Policies of American Industry*. Philadelphia, Pa.: Wharton School of Finance, 1971.

"Passenger Helicopter Pilot." *Ebony*, June 1957, pp. 128ff.

Flight Attendants

Claudia Oakes
Associate Curator
Department of Aeronautics, NASM

The world's first eight stewardesses, all nurses (not more than 25 years old, 5 ft. 4 in. tall, 125 lb.), began work on May 15, 1930. Ellen Church (upper left) was responsible for getting them hired.

An airline journey without flight attendants would be unimaginable to a modern-day traveler. Flight attendants have become almost as indispensable as the aircraft itself, but this was not always the case. In the early days of commercial air travel, flying was not the most comfortable form of transporation, and many people were apprehensive about traveling by airplane. Routes were often long, and there were frequent stops.

Western Air Express was the first to use "stewards" in the United States in 1928. Western had received a grant of $180,000 from the Guggenheim Foundation to form a "Model Airway" to determine whether an airline could make money carrying only passengers. For the first time, passengers were to be given priority over mail and freight.

The "Model Airway" began its service on May 26, 1928, with a flight between Los Angeles and San Francisco. The 12-passenger Fokker F–10 trimotor was fully booked. According to the next day's edition of the *Los Angeles Times*, " . . . C.C. Drury combined the jobs of relief pilot, radio operator and steward." Mr. Drury, the article went on to say, " . . . passed out prepared lunches consisting of fried chicken, sandwiches, fruit, and cake." The meals came from a Los Angeles restaurant called "The Pig 'n' Whistle."

Early in 1930, Ellen Church, a registered nurse, visited the Boeing Air Transport office in San Francisco to discuss with the district manager her desire to become a pilot. Although she did not obtain a pilot position, Ms. Church did convince Boeing that hiring women as flight attendants would not only free copilots for their regular duties but also would be a good way to show people that flying was safe. Thus on May 15, 1930, the first group of eight stewardesses began service to Chicago in a Boeing 80A Transport, eastbound on the exhausting 20-hour, 13-stop route from San Francisco. Cheyenne was the halfway point, so four worked the San Francisco-to-Cheyenne leg and four the Cheyenne-to-Chicago leg.

The original requirements for stewardesses were that they be single, registered nurses, not more than 25 years old, weigh not more than 125 pounds, and not be more than 5 feet 4 inches tall. The first stewardesses were paid $125 per month for 100 hours of flying. In addition to serving passengers, they assisted in refueling the aircraft, transferring baggage, and mopping the cabin floors. Being nurses, flight attendants were natural candidates for military service in World War II. Many left commercial flying to join the U.S. armed forces. As a result, by 1942 the airlines had been forced to drop the registered nurse requirement in order to recruit new stewardesses. Some substituted the requirement of two years of accredited college plus two years of business experience; others substituted at least one year of accredited college. In 1942, most U.S. airlines required these general qualifications: between 21 and 26 years of age at the time of employment; single; between 5 feet 2 and 5 feet 5 inches tall; "good eyesight" (no glasses); good teeth (even and no gold showing when smiling); good figure; slender legs; natural color of hair; between 100 and 125 pounds. Rates of pay ranged from $100 to $150 per month depending on length of service, with additional funds for expenses while they were away from their home base. The above statistics are taken from the 1942 edition of the U.S. Office of Education's career brochure, "Air Line Hostess."

Beginning in the late 1960s, when the women's and civil rights movements were so prominent, airline rules for flight attendants changed, eliminating rules of no marriage and no children and opening the profession to more men and minorities. There are now several husband-and-wife flight attendant teams.

According to recent statistics from United Airlines, half of their 8700 flight attendants are married, 20 percent have children, 13 percent are men, and 17 percent are members of a minority group.

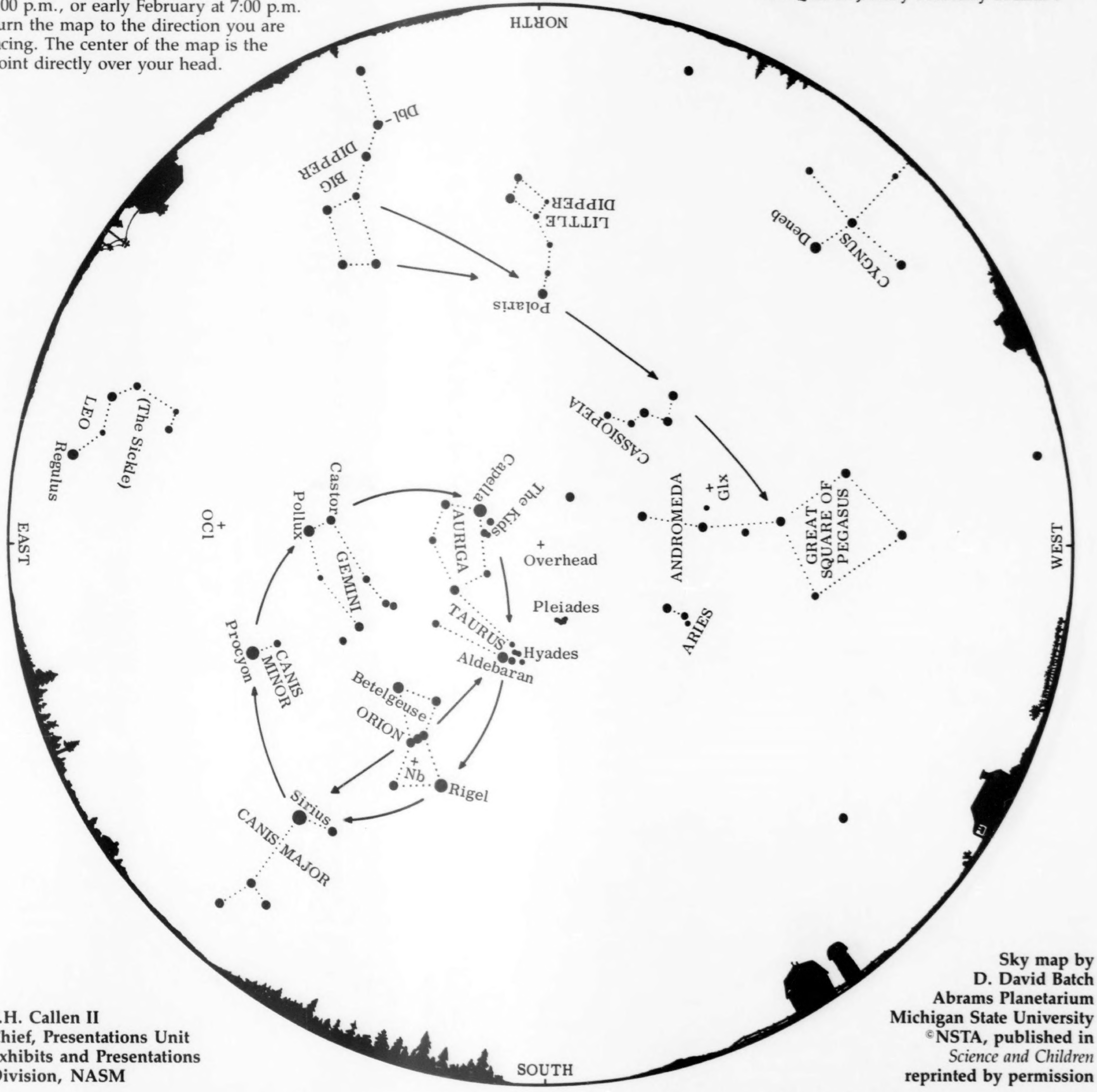
Requirements for flight attendants in 1982 differ sharply from those of the first eight stewardesses 52 years ago. Now they must be at least 20 years old when hired and can work until they are 60. They can be up to 6 feet tall; their average age is 31; their average seniority is eight and a half years. They earn $1700 per month for 75 hours of work and get about 16 days a month off.

Those first eight are not forgotten in all these changes, however. In 1980, United Airlines dedicated one of their Boeing 747s as *The Original Eight* and inscribed their maiden names beneath the cockpit window. ■

Winter 1982 Sky Map

This circle represents the night sky as it appears in early January at 9:00 p.m., late January at 8:00 p.m., or early February at 7:00 p.m. Turn the map to the direction you are facing. The center of the map is the point directly over your head.

PHASES OF THE MOON
New Moon: January 14/February 13/March 14
First Quarter: January 22/February 20/March 22
Full Moon: January 28/February 27/March 28
Last Quarter: January 6/February 4/March 6



Sky map by
D. David Batch
Abrams Planetarium
Michigan State University
©NSTA, published in
Science and Children
reprinted by permission

T.H. Callen II
Chief, Presentations Unit
Exhibits and Presentations
Division, NASM

A look at this issue's Sky Map shows that there are no planets visible at chart time. However, elusive Mercury will be visible in the evening twilight from the beginning of 1983 through about January 10, and in the morning from January 22 through March 16.

Venus is a brilliant object in the western evening sky at the beginning of the year. It will be in conjunction with Mercury on January 7 and with Mars on February 18. In both cases, Venus is the brighter of the two objects.

Red Mars will be visible in the evening twilight from the beginning of the year through the first few days of April when it becomes lost in the glare of the Sun. Jupiter rises well before sunrise early in 1983. The same holds true for Saturn.

Let's consider a project about the planets that can be worked on throughout the year. One cannot view the planets as seen against the background stars without wondering how they would appear relative to each other as seen from the Solar System's North Pole. First, the orbits for the five naked-eye planets and the Earth will need to be drawn to scale.

Next decide on a color code for the markers that will represent the planets to be plotted on the orbit charts. (For example, blue for Earth and red for Mars.) Construction paper and a one-hole hand punch make a pretty good combination when it comes to making "planets."

Next, a circular protractor is used along with the heliocentric planet positions from *The Astronomical Almanac* to place them in their proper positions, month by month, along their orbits. Use one set of charts per month so that the finished charts are not too cluttered, especially for the fast moving planet Mercury.

A simple variation would be to plot the planets twice; once for the beginning of the month, and once for the end. In this way a whole month's worth of planetary motion could be represented.

By watching the changing positions of the planets against the background stars and making comparisons with the constructed planet charts, it should become clear why two planets appear close together; why another is undergoing retrograde motion; and why a fourth cannot be seen in the sky no matter what the time of day because it is lost in the glare of the Sun.

Luftgüter - Abferti
NNOVER
KÖLN-PARI

Due to a small payload capacity of early airplanes, all passengers and freight (including unusual cargo) had to be weighed.

National Air and Space Museum
Smithsonian Institution
Washington, DC 20560
Room P-700

Non-Profit Org.
U.S. Postage
Paid
Permit #3361
Baltimore, Md.

800941

UNIVERSITY MICROFILMS
SERIALS PROCESSING
300 N. ZEEB ROAD
ANN ARBOR, MI 48106